

- E1
1. A method of producing a mammal comprising the steps of:
 - a. collecting sperm cells from a male of a species of mammal;
 - b. establishing a sperm cell source which supplies sperm cells to be separated;
 - c. sensing a sex characteristic of said sperm cells;
 - d. separating sperm cells based upon said sex characteristic;
 - e. establishing an insemination sample having a low number of separated sperm cells capable of fertilizing at least one egg within said female of said species of said mammal at success levels comparable to a typical insemination dosage;
 - f. inserting a portion of said insemination sample into a female of said species of said mammal;
 - g. fertilizing at least one egg within said female of said species of said mammal; and
 - h. producing an offspring mammal.

2. A method of producing a mammal as described in claim 1 wherein said step of establishing an insemination sample having a low number of separated sperm cells capable of fertilizing at least one egg within said female of said species of said mammal at success levels comparable to a typical insemination dosage comprises establishing an insemination sample having a low number of separated sperm cells capable of fertilizing at least one egg within said female of said species at success levels selected from the group consisting of at least 35%, at least 41%, at least 50%, and at least 90%.

- E2
5. A method of producing a mammal as described in claim 1 wherein said female of said species of said mammal has uterine horns and wherein said step of inserting a portion of said insemination sample into said female of said species of said mammal comprises the step of inserting said portion of said insemination sample both ipsi- and contra-lateral within the uterine horns of said female of said species of said mammal.

6. A method of producing a mammal as described in claim 1 wherein said female of said species of said mammal has at least one uterine horn and wherein said step of inserting said portion of said insemination sample into said female of said species of said mammal comprises the step of inserting said portion of said insemination sample deep within said uterine horn.
7. A method of producing a mammal as described in claim 5 wherein said step of inserting said portion of said insemination sample into a female of said species of said mammal further comprises the step of inserting said portion of said insemination sample deep within said uterine horns.
- E2 8. A method of producing a mammal as described in claim 6 wherein said step of inserting said portion of said insemination sample into a female of said species of said mammal further comprises the step of inserting said portion of said insemination sample within said uterine horn through the use of embryo transfer equipment.
9. A method of producing a mammal as described in claim 7 wherein said step of inserting said portion of said insemination sample into a female of said species of said mammal further comprises the step of inserting said portion of said insemination sample within said uterine horns through the use of embryo transfer equipment.
10. A method of producing a mammal as described in claim 5 wherein said step of inserting said portion of said insemination sample into a female of said species of said mammal comprises the step of inserting said portion of said insemination sample twelve hours after the time which is generally regarded as optimal for a single insemination.
11. A method of producing a mammal as described in claim 9 wherein said step of inserting said portion of said insemination sample into a female species of said mammal occurs not later than about seventeen hours from said step of establishing an insemination sample

having a low number of separated sperm cells capable of fertilizing at least one egg within said female of said species of said mammal at success levels comparable to a typical insemination dosage.

- E2* 12. A method of producing a mammal as described in claim 9 wherein said step of inserting said portion of said insemination sample into a female of said species of mammal occurs not later than about ten hours from said step of establishing said insemination sample.
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16. A method of producing a mammal as described in claim 1 further comprising the steps of:
- a. providing a flow cytometer;
 - b. establishing a sheath fluid for said sperm cells; and
 - c. collecting said sperm cells having the desired sex characteristic.

- E3* 17. A method of producing a mammal as described in claim 16 wherein said step of collecting said sperm cells having the desired sex characteristic further comprises the step of cushioning said sperm cells from impact with a collector.

18. A method of producing a mammal as described in claim 16 wherein said step of providing a flow cytometer comprises the step of providing a high speed sorting flow cytometer, wherein said high speed sorting flow cytometer separates said sperm cells at a rate of greater than 500 sorts per second.

19. A method of producing a mammal as described in claim 3 further comprising the step of using an ovulatory pharmaceutical to cause multiple eggs to be produced.

20. A method of producing a mammal as described in claim 19 wherein said ovulatory pharmaceutical is injected in half day increments between any of days 2 to 18 of the estrus cycle.

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21. A method of producing a mammal as described in claim 20 wherein said step of using an ovulatory pharmaceutical to cause multiple eggs to be produced comprises the step of injecting a dosage of follicle stimulating hormone.
22. A method of producing a mammal as described in claim 21 wherein said step of injecting said dosage of follicle stimulating hormone in approximately half day increments comprises a dosage level of 6, 6, 4, 4, 2, 2, 2, and 2 mg between days 9 and 12 inclusive of the estrus cycle and further comprising the step of injecting 25 mg and 12.5 mg of prostaglandin F-2-alpha on the sixth and seventh dosages, respectively, of said follicle stimulating hormone.
23. A method of producing a mammal as described in claim 16 further comprising the step of staining said sperm cells of said male of said species of mammal with at least about 38 micro-molar concentration of stain.
24. A method of producing a mammal as described in claim 16 further comprising the step of chemically coordinating a sheath fluid environment for sperm cells which is coordinated with both pre-sort and post-sort sperm cell fluid environments.
25. A method of producing a mammal as described in claim 1, 2, 16, 17 or 18 wherein collecting sperm cells from a male of a species of mammal comprises collecting said sperm cells from a male of a species selected from the group consisting of bovines, and equines.
26. A method of producing a mammal as described in claim 25 wherein said step of chemically coordinating a sheath fluid to create a sheath fluid environment for said sperm cells which is coordinated with both a pre-sort and a post-sort cell fluid environments
- 21?

comprises the step of establishing a cell source which supplies bovine sperm cells and the step of establishing a sheath fluid which contains about 2.9% sodium citrate.

27. A method of producing a mammal as described in claim ^{24?}25 wherein said step of chemically coordinating a sheath fluid to create a sheath fluid environment for said cells which is coordinated with both a pre-sort and a post-sort cell fluid environment comprises the step of establishing a cell source which supplies equine sperm cells and the step of establishing a sheath fluid which contains a hepes buffered medium.
28. A method of producing a mammal as described in claim 16 wherein said step of collecting said sperm cells having the desired sex characteristic further comprises the step of avoiding impact of said sperm cells with a collector.
29. A method of producing a mammal as described in claim 28 wherein said step of avoiding impact of said sperm cells with said collector comprises the step of providing a collection container having a diameter of at least fifteen millimeters.
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165. A method of producing a mammal as described in claim 28 wherein said step of avoiding impact of said sperm cells with said collector comprises the step of providing a collection container having stream matched physical characteristics.

166. A method of producing a mammal as described in claim 16 wherein said step of collecting said sperm cells having the desired sex characteristic further comprises the step of providing a citrate collection fluid containing about six percent egg yolk prior to commencing said step of collecting.

167. A method of producing a mammal as described in claim 18 further comprises the step of operating said flow cytometer with in the range of about 5 kilohertz to about 50 kilohertz.

168. A method of producing a mammal as described in claim 185 further comprises the step of separating said sperm cells at a rate of at least 1200 sorts per second.
169. A method of producing a mammal as described in claim 3 wherein said step of establishing an insemination sample having a low number of separated sperm cells capable of fertilizing at least one egg within said female of said species of said mammal at success levels comparable to a typical insemination dosage comprises the step of establishing an insemination sample selected from the group consisting of: a bovine insemination sample of no more than one hundred thousand sperm cells, a bovine insemination sample of no more than two hundred fifty thousand sperm cells, a bovine insemination sample of no more than three hundred thousand sperm cells, an equine insemination sample of no more than one million sperm cells, an equine insemination sample of no more than five million sperm cells, an equine insemination sample of no more than ten million sperm cells, and an equine insemination sample of no more than twenty-five million sperm cells.
170. A method of producing a mammal as described in claim 4 wherein said step of inserting a portion of said insemination sample into a female species of said mammal and said step of fertilizing at least one egg within said female species of said mammal occurs in a field environment.
171. A method of producing a mammal as described in claim 14 wherein said step of inserting said portion of said insemination sample into a female of said species of said mammal comprises inserting a portion of an insemination sample wherein a substantial portion of said separated sperm cells have the desired sex characteristic.
172. A method of producing a mammal as described in claim ¹⁷¹~~189~~ wherein said step of inserting a portion of an insemination sample wherein a substantial portion of said separated sperm cells have the desired sex characteristic comprises selecting said

insemination sample from a group consisting of an insemination sample wherein at least 60 percent of said separated sperm cells have the desired sex characteristic, an insemination sample wherein at least 70 percent of said sperm have the desired sex characteristic, an insemination sample wherein at least 80 percent of said sperm have the desired sex characteristic, and an insemination sample wherein at least 90 percent of said sperm have the desired sex characteristic.

E4

173.

A method of producing a mammal as described in claim ¹⁷²490 wherein said step of producing an offspring mammal comprises producing a predetermined sex ratio of fetuses.
